

*Secrets of Nature:
The Bacon Debates Revisited*

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Francis Bacon rose to power during a period of social and intellectual upheaval. The colonization of the Americas, the rise of mercantile capitalism, the wars of religion, the revival of ancient learning, and skepticism over medieval philosophy made the early seventeenth century particularly transformative.¹ Brian Vickers's removal of Bacon from this social, economic, and intellectual milieu to focus on *ressentiment* as an irrational rationale for the criticism of Bacon demeans both Bacon and those who have contextualized his thought. By using debasing words rather than historical events, metaphor rather than analysis, and pejorative terms rather than rational argument, Vickers attempts to sweep Bacon's critics from history. His would-be argument is set up as a series of rhetorical shots across the bow in an emotional appeal and attempt to persuade the reader.

The use of phrases, such as feminist indictment, official approval, hostile reinterpretation of metaphor, unsureness of texts, and the projection of grievance and complaint onto the past, is meant to influence the reader's mindset. Derogatory characterizations carry the weight of the supposed ar-

¹ Brian Vickers, "Francis Bacon, Feminist Historiography, and the Dominion of Nature," *JHI*, 69 (2008): 117–41. Vickers's article is, in part, a critique of Carolyn Merchant, "The Scientific Revolution and the Death of Nature," *Isis*, special Focus section on Carolyn Merchant's *The Death of Nature* 97 (2006): 513–533. This article is both a response to Vickers and an exploration of the connections between women and nature as viewed through the "secrets of nature" tradition and the anatomy theater as exemplars of the confined, controlled experimental method developed by Francis Bacon and his followers.

gument: jaundiced versus balanced views, careless and unscrupulous interpretation versus careful history, diatribe versus respect, sophism versus reason, hostile interpretation and regrettable framing versus harmless metaphor. Emotionally charged terms relegate any would-be critics with opposing views to the dustbin: predictable significance, eagerness to brand, attempt to align, seriously defective, trivialization, emotive analogy, hostility toward male scientists, failure to take proper notice of the authority of the Bible, and on and on. The rhetorical basis of the article precludes any attempt at serious debate over the meaning of a vitally important period of history.

A deep divide exists between Bacon's supporters and detractors—one that this essay cannot hope to resolve. The deeper roots of this divide lie in perceptions of the Scientific Revolution as a grand narrative of progress and hope versus one of decline and disaster. How one views the Scientific Revolution itself is a marker of how one might assess the import of Bacon's contributions. As E. J. Dijksterhuis characterized it in the mid-twentieth century:

That the adoption of the mechanistic view has had profound and far reaching consequences for the whole of society is an historical fact which gives rise to the most divergent opinions. Some commend it as a symptom of the gradual clarification of human thought, of the growing application of the only method that is capable of producing reliable results in every sphere of knowledge. . . . Others, though recognizing the outstanding importance it has had for the progress of our theoretical understanding and our practical control of nature, regard it as nothing short of disastrous in its general influence on philosophical and scientific thought as well as on society.²

² E. J. Dijksterhuis, *The Mechanization of the World Picture*, trans. C. Dikshoorn (Oxford: Clarendon Press, 1964 [originally published, 1950], 3–4. Critics of Bacon include: Max Horkheimer and Theodor Adorno, *Dialectic of Enlightenment*, trans. John Cumming (New York: Herder & Herder, 1972); William Leiss, *The Domination of Nature* (New York: George Braziller, 1972). See also Nieves Matthews, “Francis Bacon: Slave-Driver or Servant of Nature,” <http://www.sirbacon.org/mathewssessay.htm>: “In 1942 Herbert Marcuse, the patron saint of a generation of leftist extremists, described Bacon as the ‘evil animus’ of modern science, while Martin Heidegger, who was still celebrating in 1953 what he called ‘the inner truth and greatness of Nazism,’ denounced in Bacon the symbol of a nefarious identification of science with technology. During those same decades Bacon’s reputation as a scientist was also at its lowest ebb.”

Views of Francis Bacon as a pivotal figure in the emergence of modern science catalyze these oppositions. The internalist-externalist debates of the 1960s, the social constructivist-realist debates of the 1980s, and the “science wars” of the 1990s reflect the polarizing positions taken by scholars of the Scientific Revolution. Some scholars read Bacon’s rhetoric and associated meanings harshly, while others interpret the same phrases and meanings benignly. Perhaps most scholars will find themselves somewhere along a continuum between these extremes.

Whether the control of nature leads to human wealth and well-being for the few or to social and ecological decline for the many depends on the underlying assumption of the narratives told by various scholars. Likewise the actors in the narratives vary according to the assumed plot: great men as scientists and philosophers building on the knowledge of their predecessors versus historical contextualization by race, gender, and class. Despite three decades of efforts to inject issues raised by feminist scholars into texts and courses, most still focus largely on the great men of the revolutionary era between Copernicus and Newton.³ Despite two decades of advance in the field of environmental history, most scholarship and courses on the Scientific Revolution ignore the environment as a major actor.⁴

Bacon’s life and work spanned the period in which science (natural philosophy), technology (the mechanical arts), and mercantile capitalism conjoined with religion to make possible a new form of knowledge (an “advancement of learning”) in the service of humankind (“the relief of man’s estate”). A narrative of progress emerges in which humanity is able to recover that which was lost in the Fall from Eden, giving hope for the betterment of humanity through the control of nature. “Man by the Fall, fell at the same time from his state of innocency and from his dominion over creation. Both of these losses, however, can even in this life be in some part repaired, the former by religion and faith, the latter by arts and sciences,” Bacon pronounced.⁵ It was through a new knowledge to be gained

³ For example, see Wilbur Applebaum, *The Scientific Revolution and the Foundations of Modern Science* (Westport, Conn.: Greenwood Press, 2005). Robert Hatch’s website, “The Scientific Revolution,” contains a brief biographical list on “women of learning.” <http://www.clas.ufl.edu/users/rhatch/pages/03-Sci-Rev/SCI-REV-Home/> Lisa Sarasohn’s *The Scientific Revolution* (Boston: Houghton Mifflin, 2006) includes a section on “Did Women Have a Scientific Revolution?”

⁴ Exceptions are Max Oelschlager, *The Idea of Wilderness: From Prehistory to the Age of Ecology* (New Haven: Yale University Press, 1991); Albert Borgmann, *Crossing the Postmodern Divide* (Chicago: University of Chicago Press, 1992).

⁵ Francis Bacon, “*Novum Organum*,” in *Works*, ed. James Spedding, Robert Leslie Ellis, Douglas Devon Heath, 14 vols. (London: Longmans Green, 1875), vol. 4, Bk II, Aphorism 52, 247–48.

from science and technology that the lost dominion could be reclaimed: “Let the human race *recover* that right over nature which belongs to it by divine bequest,” he asserted.⁶

Bacon’s narrative reversed the tragedy of the Fall to a comedy of recovery. The plot of the recovery narrative was an upward or progressive trajectory ending in a new happiness on earth, rather than in the pain of a lost Edenic happiness. The road to recovery lay in the interrogation and cross-examination of nature. “I mean (according to the practice in civil causes) in this great plea or suit granted by the divine favor and providence (whereby the human race seeks to *recover* its right over nature) to examine nature herself and the arts upon interrogatories.”⁷ The new narrative was made possible by the discoveries of the Americas, the new mechanical devices of early capitalist society, and most importantly for Bacon a new experimental method based on the “disclosing of the secrets of nature.”⁸

It was Bacon’s singular achievement to demonstrate through rhetoric, metaphor, and vivid example how the “secrets of nature” could be extracted and put into use in the service of humankind.⁹ Bacon’s thought evolved during a period in which natural magic emerged as a new practical technique for understanding the workings of the natural world through the manipulation of matter. The writings of Della Porta, Agrippa, Ficino, Pico della Mirandola, Paracelsus, Bruno, and John Dee constituted the “scientific” antecedents on which Bacon built his new philosophy. John Dury, Samuel Hartlib, Joseph Glanvill, Thomas More, and Robert Boyle became the scientific successors who built on Bacon’s inspiration and who along with Bacon transformed the natural magic tradition into a new science based on the experimental method.

⁶ Francis Bacon, “*Novum Organum*,” in *Works*, vol. 4, Bk. I, Aphorism 129, 115, emphasis added.

⁷ Bacon, “Preparative Towards a Natural and Experimental History (*Parasceve*),” in *Works*, 4: 263, emphasis added.

⁸ Carolyn Merchant, *Reinventing Eden: The Fate of Nature in Western Culture* (New York: Routledge, 2003), ch. 1, 4 and pp. 74–75.

⁹ Lorraine Daston and Katharine Park write: “Bacon sometimes referred to natural history as a “warehouse,” one that must be constantly replenished and drawn upon if natural philosophy were ever to fathom the secrets of nature.” See Lorraine Daston and Katharine Park, *Wonders and the Order of Nature, 1150–1750* (New York: Zone Books, 1998), 224; see Bacon, *Novum Organum*, in *Works*, vol. 4, Bk. 1, Aphorism 18, 50. This is why Bacon contended that “from the wonders of nature is the nearest intelligence and passage towards the wonders of art: for it is no more by following and as it were hounding Nature in her wanderings, to be able to lead her afterwards to the same place again.” Daston and Park, *Wonders*, 223. See Bacon, *Advancement of Learning* (1605), in *Works*, 3: 331; “*De Agumentis*” (1623), in *Works*, 4: 296.

The confined, controlled experiment that could be witnessed, replicated, and validated by a multitude of observers replaced the individualistic, arcane secrets known only to the *magus*, the astrologer, and the witch. That new method, I argue in what follows, was rooted, at least in part, in gendered interconnections between the secrets of nature and the secrets of women and in new forms of knowledge extracted from female nature and the female body. By reforming the secrets tradition, the private secrets held by both nature and women could be revealed. The anatomy of nature and the anatomy of the body could be exposed for the benefit of humankind.¹⁰

It is out of the genre of the “secrets of nature” that Bacon formulated significant aspects of his experimental philosophy. Della Porta’s *Natural Magic, or the Secrets and Miracles of Nature* provided numerous examples of “transformations” for the “scientists” of Bacon’s “New Atlantis” that would inspire his followers. Bacon drew on the “secrets tradition” when he wrote: “There is much ground for hoping that there are still laid up in the womb of nature many secrets of excellent use having no affinity or parallelism with anything that is now known . . . only by the method of which we are now treating they can be speedily and suddenly and simultaneously presented and anticipated.”¹¹

¹⁰ In “The Scientific Revolution and the Death of Nature” (2006), *op. cit.*, I used the example of the witch and the rack to discuss the emergence of the controlled experiment. Here I provide another context for the controlled, constrained experimental method based on anatomy and dissection.

¹¹ Francis Bacon, *Novum Organum*, in *Works*, vol. 4, Aphorism 109, p.100. For the Latin, see Bacon, *Novum Organum*, *Works*, I: 208: “Itaque sperandum omnino est, adhuc esse in naturae sinu multa excellentis usus recondita, quae nullam cum jam inventis cognitionem habent aut parallelismum, sed omnino sita sunt extra vias phantasiae. . . .” Although Spedding, et al, translate *naturae sinu* as the womb of nature, others translate it as the bosom of nature. One possible, although uncommon, meaning of bosom in the early modern period was uterus; other meanings included a curved recess, cavity, or hollow interior (*Oxford English Dictionary*, compact ed., 1: 252). Also while Spedding, et al, employ the term secrets, other translations use things, matters, or treasures. Secret not only meant hidden from view, but also referred to the sex organs. (*OED*, compact ed., 2: 2702). Fulton Anderson uses the Spedding translation in Francis Bacon, *The New Organon and Related Writings*, ed. Fulton Anderson (New York: Liberal Arts Press, 1960), Bk. I, Aphorism, 109, p.102. Basil Montague translates the passage as: “We may, therefore, well hope that many excellent and useful matters are yet treasured up in the bosom of nature, bearing no relation or analogy to our actual discoveries, but out of the common track of our imagination, and still undiscovered. . . .” See Francis Bacon, *Novum Organum 1620*, Basil Montague, ed. and trans., *The Works*, 3 vols. (Philadelphia: Parry & MacMillan, 1854), vol. 3, Bk. I, Aphorism 109, p.365. Lisa Jardine and Michael Silverthorne translate the passage as: “Therefore it is very much to be expected that many exceedingly useful things are still hidden in the bosom of nature. . . .” See Francis Bacon, *The New Organon*, ed. Lisa Jardine and Michael Silverthorne (Cambridge: Cambridge University Press, 2000), Bk. I, Aphorism 109, p.86.

The secrets tradition for Bacon included “narratives of sorceries, witchcrafts, charms, dreams, divinations, and the like. . . .” Out of “speculation” about these, he wrote, “a useful light may be gained, not only for a true judgment of the offences of persons charged with such practices, but likewise for the further disclosing of the secrets of nature.”¹² What was useful in the occult sciences should be ferreted out and applied to the benefit of humanity.

William Eamon has analyzed the tradition of natural magic in *Secrets of Nature: Books of Secrets in Medieval and Early Modern Culture*.¹³ He argues that “the ‘new science’ of the seventeenth century has its roots, in part, in the practical activities of artisans, alchemists, and common healers. . . . By publishing the ‘secrets’ of craftsmen and experimenters, early modern printers created a body of empirical knowledge that became the basis for the ‘Baconian sciences’ of the seventeenth century.”¹⁴ Natural magic was closely bound to the demonic magic banned by the Catholic Church. Eamon points out that “the church condemned all magical activity as heretical. Natural magic was caught up along with popular superstitions, witchcraft, and consort with demons.”¹⁵

The secrets tradition was a “research programme” that offered a window onto nature and the search for nature’s secrets—a tradition that would lead from the natural magic of the sixteenth century, through Bacon’s “New Atlantis” which appeared in eight editions between 1626 and 1658, to experimentation on “the hidden causes of things” in the second half of

¹² Bacon, “*De Dignitate et Augmentis Scientiarum*” (“Of the Dignity and Advancement of Learning,” written 1623), *Works*, vol. 4, Bk. II, p.296. The first edition of the *Advancement of Learning*, written in English in 1605, states: “Yet from the speculation and consideration of them light may be taken, not only for the discerning of the offences, but for the further disclosing of nature.” Bacon, *Advancement* in *Works*, 3: 330–331. The Latin edition of 1623 states “Ideoque licet hujusmodi artium usum et praxim merito damnandum censeamus, tamen a speculatione et consideratione ipsarum (si strenue excutiantur) notitiam haud inutilem consequemur, non solum ad delicta in hoc genere reorum rite dijudicanda, sed etiam ad naturae secreta ulterius rimanda.” Bacon, *De Dignitate et Augmentis Scientiarum* in *Works*, 1: 496, 498. The French translation of 1624 states: “Et partant encore que la pratique de telles choses soit à condamner, toutefois de la spéculation & considération d’icelles, l’on peut prendre de la offences, mais pour d’avantage de secourir la nature.” Bacon, *Le Progrez et avancement aux sciences diuines & humaines* (Paris: Pierre Billaine, 1624), Bk. 2, Ch 2, 197, 199–201 (French modernized).

¹³ William Eamon, *Science and the Secrets of Nature: Books of Secrets in Medieval and Early Modern Culture* (Princeton: Princeton University Press, 1994). See also Pierre Hadot, *The Veil of Isis*, trans. Michael Chase (Cambridge, Mass.: Harvard University Press, 2006).

¹⁴ Eamon, http://honors.nmsu.edu/weamon/sci_secrets.html

¹⁵ Eamon, *Science and the Secrets of Nature*, 195.

the seventeenth century.¹⁶ Giovan Abioso da Bagnola, a sixteenth-century tutor of Giambattista Della Porta, sought to restore human dominion over the natural world—goals echoed by Bacon in the phrases quoted above. Bagnola's *instauratio magna* (anticipating Bacon's own title) stated that one must turn away from the ancients and “hunt for the new secrets of nature” (*venari nova naturae secreta*).¹⁷ Eamon writes:

According to the epistemology of the hunt, since nature's secrets were hidden beyond the reach of ordinary sense perception, they had to be sought out by extraordinary means. Instruments had to be made, for example, which would enable researchers to ‘look out at and look into’ (*auspiciet et inspiciet*) nature, as the motto of the Lincean Academy expressed it. Experiments had to be devised that would enable researchers to penetrate nature's interior, ‘Twisting the lion's tail’ to make her cry out her secrets. As Bacon expressed it, nature, like Proteus, had to be constrained by experiments that forced it out of its natural condition, for ‘the secrets of nature reveal themselves more readily under the vexations of art than when they go their own way.’ Finally, new methods of reasoning had to be found to take the place of scholastic logic, which according to the early moderns was incapable of reaching the inner recesses of nature and laying bare its secrets.¹⁸

That the secrets tradition directly influenced Bacon is clear not only from his references to disclosing the secrets of nature, but also from the influence of Agrippa and Della Porta on the transformations of nature depicted in the “New Atlantis.” Here “scientists” perfected existing organ-

¹⁶ Eamon, *Science and the Secrets of Nature*, 195, 291. On the complex and differing roles of the occult sciences in the Renaissance and their relationship to early modern science, see William R. Newman and Anthony Grafton, ed., *Secrets of Nature: Astrology and Alchemy in Early Modern Europe* (Cambridge, Mass.: MIT Press, 2006).

¹⁷ Eamon, *Science and the Secrets of Nature*, 197–98.

¹⁸ Eamon, *Science and the Secrets of Nature*, 285; Bacon, *Novum Organum*, in *Works*, vol. 4, Bk. I, Aphorism 98, p. 95. Jardine and Silverthorne, *New Organon*, Bk 1, p.81 translate the passage as: “. . . the secrets of nature reveal themselves better through harassments applied by the arts than when they go on in their own way.” Fowler's Latin edition, *Novum Organum*, Bk. I, p. 304 is: “Occulta naturae magis se produunt per vexationes artium, quam cum cursu suo meant” and he adds the following footnote (p. 304, note 82): “Nature best discovers her secrets, when tortured by Art. This is an excellent illustration of the advantage which Experiment, at least in many cases, possesses over Observation.” *Bacon's Novum Organum*, ed with introduction and notes by Thomas Fowler, 2nd ed. (Oxford: Clarendon Press, 1889).

isms (such as serpents, worms, flies, and fishes), produced entirely new species by “making one plant or tree turn into another,” experimented to see what “new dissection and trials” could be “wrought on the body of man,” and developed methods to control the weather. Bacon refuted the constraints against such manipulations that had hampered the natural magicians owing to threats by the Inquisition.¹⁹ His objective was to recover “man’s right over nature” lost in the Fall. As Bacon put it: “The end of our foundation is the knowledge of causes and secret motions of things and the enlarging of the bounds of human empire, to the effecting of all things possible.”²⁰

The rise of modern science in the seventeenth century depended on a transition from occult to public knowledge of nature’s secrets, from constraints against the penetration of nature’s inner recesses to the assumption that nature herself was willing to reveal her own secrets. In 1160, Alain of Lille, of the School of Chartres, recounted an allegory in which *Natura*, God’s humble servant weeps over human failure to obey her laws. As humans aggressively penetrate the secrets of the heavens, they tear her garments of modesty and expose her to the public. Similarly, in 1490–95, an old hermit of Lichtenstat tells a story in which Mother Earth in a tattered green gown is defended against a miner accused of matricide. The miner pleads his case by arguing that the Earth is not a real mother, but a wicked stepmother who conceals her bounty in her inner recesses. By contrast, in the nineteenth century, Nature is depicted in sculptures by Louis-Ernest Barrias as removing her own veil and willingly revealing herself to science.

¹⁹ Merchant, *Death of Nature*, pp. 180–86. Bacon, “New Atlantis,” *Works*, 3: 157–59; Giambattista Della Porta, *Natural Magic*, ed. D. J. Price (facsimile of 1658 edition, New York: Basic Books, 1957; first published 1558), 27, 29, 31–40, 61–62, 73, 74–75, 81, 95–99; Henry Cornelius Agrippa, *The Vanity of Arts and Sciences* (London, 1694; first published 1530), 252–53.

²⁰ Bacon, “New Atlantis,” in *Works*, 3: 156. In the *Novum Organum*, he stated it as follows: “But if a man endeavour to establish and extend the power and dominion of the human race itself over the universe, his ambition (if ambition it can be called) is without doubt both a more wholesome thing and a more noble than the other two. Now the empire of man over things depends wholly on the arts and sciences. For we cannot command nature except by obeying her.” Bacon, *Novum Organum*, in *Works*, vol. 4, Bk. I, Aphorism 129, p. 114. This last phrase is often used to exonerate Bacon from the charge that his goal was the domination and control of nature by pointing out that, for Bacon, nature must be obeyed. But the experimental method that leads to the control of nature is in no way inconsistent with obeying nature’s laws. Indeed, science cannot work outside of the laws of nature. It can, however, use those laws to manipulate and control the natural world for human benefit. (Examples include hydropower, nuclear power, genetic engineering, stem cell research, nanotechnology, and so on.)

Francis Bacon's *Instauratio Magna* lies at the center of this transition from private secrets to public knowledge. The transition itself, however, cannot be understood apart from its context of gendered rhetoric, ways of seeing, and representations of woman and nature.²¹

What was the nature of the "nature" that harbored those secrets? Abundant evidence shows that most thinkers of the Renaissance and Scientific Revolution cast nature in the female gender. This was true, not only because nature was gendered as female in the Romance languages deriving from the Latin *Natura*, but more broadly because of a pervasive worldview, held at all levels of society, that symbolized, allegorized, and characterized Nature as female, virgin, mother, and witch. The earth too was female having deep recesses, cavities, and wombs in which grew the seeds of living things, including stones and metals.²² Likewise abundant evidence indicates that, despite courtly traditions, females were held in lower esteem than the men of their class and that, as feminist scholarship has shown, women experienced neither a Renaissance nor a Scientific Revolution until the emergence—at the upper levels of society—of the learned ladies of the Enlightenment.

Perhaps nowhere is the dichotomy between men's minds and women's bodies so blatant as in depictions of the "anatomy theaters" of early modern Europe that provided the context for Francis Bacon's efforts to create an anatomy of the world that would reveal the secrets of nature. Bacon's (and James I's) physician was William Harvey who had studied at Padua, and the anatomy theaters of Italy and Leiden were known in English culture. The anatomy theater, the witnessing of the anatomy lesson, and the dissection of nature and the body by hand and mind epitomize the controlled, constrained experimental method toward which Bacon was groping. Knowing Nature's anatomy could lead to the recovery of the knowledge lost in the Fall from Eden. While Bacon does not describe dissections of the female body, he draws on anatomy and dissection in his rhetoric about extracting the secrets of nature.

That women's bodies concealed secrets to be extracted in the service of humanity has been artfully argued by Katharine Park in *Secrets of Women: Gender, Generation, and the Origins of Human Dissection* (2006). In the tradition of the history of "secrets," women both harbored and knew the secrets of nature. As maidens, mothers, midwives, and witches, women

²¹ Merchant, *Death of Nature*, 10, 32–33, 190. Merchant, *Earthcare: Women and the Environment* (New York: Routledge, 1996).

²² Merchant, *Death of Nature*, Ch. 1.

knew women's bodies and the herbs and medicines that could be used for all aspects of women's reproduction—from menstruation to fertility, pregnancy, childbirth, and abortion. In the changing history of human dissection from the Middle Ages to the Renaissance, the secrets of women evolved from secrets known only to and by women to the secrets that women's bodies could reveal though the scientific study of female anatomy. While women accumulated a vast reservoir of knowledge that was passed down among neighbors and kin, no formal means of accumulating and recording that knowledge existed until science collected, collated, and publicized the data.²³

Elaborating on Jonathan Sawday's analysis of the gendered "art of seeing," in Vesalius's *De humani corporis fabrica* (1543, 2nd ed. 1555), Park reveals the hidden meanings in Vesalius's title page that depicted the dissection of a female body and the counterpoint meanings in the accompanying portrait of Vesalius himself. The title page shows the public dissection, in the center of a rotunda, of the body of a female criminal who has been hanged. Her naked, prone body with genitals exposed and reproductive organs dissected lies at the center of a large crowd of male observers with Vesalius himself standing over her and pointing to the secrets of her womb. The active mastery of the standing, gesticulating male voyeurs contrasts with the passivity of the supine female object at center stage. Park observes: "The corpse is displayed in a way calculated to call maximum attention to her genitals, in the style of contemporary erotic prints," such as that of Jacopo Caraglio in *Mercury and Aglaurus*, a graphic of the late 1520s that displayed the female genitals through the open legs of the reclining lover.²⁴

The only other clearly identifiable woman in Vesalius's title page stands between two pillars in the background peering from beneath a veil. She

²³ Katharine Park, *Secrets of Women: Gender, Generation, and the Origins of Human Dissection* (New York: Zone Books, 2006), 256. Park's analysis does not include witches.

²⁴ Park, *Secrets of Women*, 249–59; Jonathan Sawday, *The Body Emblazoned: Dissection and the Human Body in Renaissance Culture* (London: Routledge, 1995); Sawday, "The Fate of Marsyas: Dissecting the Renaissance Body," in *Renaissance Bodies: The Human Figure in English Culture, c. 1540–1660*, ed. Lucy Grant and Nigel Llewellyn (London: Reaktion, 1990), 112–35. For the analysis of Vesalius's title page, see also Hillary Nunn, *Staging Anatomies: Dissection and Spectacle in Early Stuart Tragedy* (Burlington, Vt.: Ashgate, 2005), 12–16. For the image of Mercury and Aglaurus by Jacobo Caraglio after Perino del Vaga, see Park, Figure 5.21, p. 254. Also Bette Talvacchia, *Taking Positions: On the Erotic in Renaissance Culture* (Princeton: Princeton University Press, 1999), Figure 55, p. 157. Caraglio produced a series of images of gods and goddesses *in flagrante delicto*. See Talvacchia, *Taking Positions*, Figures 35–56, pp.140–60.

may be the midwife who would have examined the condemned woman for evidence of pregnancy before her execution. She exemplifies woman's knowledge of woman's secrets now exposed to the vulgarity of the raucous crowd.²⁵

The iconography of Vesalius's female-centered title-page contrasts with the male dominated iconography of the portrait of Vesalius himself. Vesalius as authorial symbol is shown standing, fully clothed, and in an enclosed, private rather than public space. He gazes with penetrating eyes at the viewer, while grasping the bulging muscles of a standing male corpse, holding the tendons of the corpse's hand in his own, emphasizing his own identity with the male subject, rather than his distance from the female object of the title page. His scalpel and manuscript lie in easy reach on the table before him, ready to record for public consumption the new knowledge of human anatomy. Science, *scientia*, as knowledge of nature available to the many, supplants the secret knowledge of the arcana accessible only to the few. The secrets harbored by women and nature become the revealed secrets of public knowledge.²⁶

In the *Fabrica*, Vesalius portrays his anatomical corpses against landscapes which serve as theaters of display. The figures dominate the surroundings—sparse vegetation and distant villages—mastering them by virtue of size and the physicality of musculature. The surroundings mask the violence of the act of dissection and the consenting violent act of the observer. As Devon Hodges puts it, “The anatomist cuts, dissects, flays, tears, and rips the body apart in order to know it.”²⁷ By participating in the seeing, the observer joins in the dissecting. The controlled setting separates the body's parts; the carefully designed theater removes the observing subject from the mastered object. In Foucault's terms, to know a dissected body is to “dominate, conquer, master, discipline, and punish it.”²⁸

Jonathan Sawday analyzes the “culture of dissection” in *The Body Embazoned: Dissection and the Human Body in Renaissance Culture*, associating it with violence and having a dark side. “[A] dissection might denote not the delicate separation of constituent structures, but a more violent ‘reduction’ into parts: a brutal dismemberment of people, things, or ideas.

²⁵ Park, *Secrets of Women*, 256–59.

²⁶ Park, *Secrets of Women*, 250

²⁷ Devon L. Hodges, *Renaissance Fictions of Anatomy* (Amherst: The University of Massachusetts Press, 1985), 5.

²⁸ Quoting Hodges's characterization of Foucault, *Renaissance Fictions*, 127, n12; See Michel Foucault, *Discipline and Punish: The Birth of the Prison*, trans. Alan Sheridan (New York: Pantheon, 1977).

. . . Anatomy, too, is an act of partition or reduction and, like dissection, anatomy is associated primarily with medicine. But, just as in the case of dissection, there lurks in the word a constant potential for violence.”²⁹

Francis Bacon associated dissection with an inquiry into nature’s secrets, writing in *The Advancement of Learning*, “In the inquiry which is made by Anatomy, I find much deficiency: for they inquire of the *parts*, and their *substances, figures, and collocations*; but they inquire not of the *diversities of the parts*, the *secreties of the passages*, and the *seats or nestlings of the humours*. . . .”³⁰ The body was made up of a series of cavities that contained secrets to be uncovered through scientific inquiry. As Sawday explains it, “Bacon’s demand for anatomies which delved into the secret cavities and receptacles of the body-space was met, in a religious context, by the true anatomist who was a dissecting and punishing God. Divine or sacred anatomy thus entered the body cavity and uncovered the inward configuration of fallen humanity.”³¹ Just as the anatomy of the New World could be explored on a macrocosmic scale though the voyages of discovery, so the body could be explored on a microscopic scale through the anatomy lesson. The microcosm-macrocosm theory that provided an organizing framework for Renaissance culture took on new meanings as an anatomy of the world.

Bacon drew on metaphors of dissection and anatomy when, in the *Novum Organum*, he announced his intent to create an “anatomy of the world.” “For I am building in the human understanding a true model of the world, such as it is in fact, not such as man’s own reason would have it to be; a thing which cannot be done without a very diligent dissection and anatomy of the world.”³² Hodges characterizes Bacon’s mission as follows:

²⁹ Sawday, *Body Emblazoned*, 1.

³⁰ Bacon, *Advancement of Learning*, in *Works*, 3: 374; elaborated in *De Augmentis*, 4: 385–86. Here Bacon laments that human dissections are performed only on dead bodies: “Of that other defect in anatomy (that it has not been practiced on live bodies) what need to speak? For it is a thing hateful and inhuman, and has been justly reprov’d by Celsus. But yet it is no less true (as was anciently noted) that many of the more subtle passages, pores, and pertusions appear in dead bodies, though they be open and manifest in live. Wherefore that utility may be considered as well as humanity, the anatomy of the living subject is not to be relinquished altogether, nor referred (as it was by Celsus) to the casual practices of surgery; since it may be well discharged by the dissection of beasts alive, which, notwithstanding the dissimilitude of their parts to human, may, with the help of a little judgment, sufficiently satisfy this inquiry” (286).

³¹ Sawday, *Body Emblazoned*, 94–95, 139, quotation on 109.

³² Bacon, *Novum Organum*, in *Works*, vol. 4, Bk. I, Aphorism 124, p.110; Hodges, *Renaissance Fictions*, 91. See also Jardine and Silverthorne, *New Organon*, Bk I, Aphorism 124, p. 96: “For we are laying the foundations in the human understanding of a true

Bacon's description of his project is couched in a rhetoric of imperialism. . . . As explorers and colonizers anatomize the world, laying it open to master it, so Bacon will lay open the intellectual world. Such projects, as Timothy Reiss has pointed out, are often imaged as acts of sexual violence; the new scientist 'is conqueror enforcing his will, a man ravishing a woman. . . .' Certainly, the act of vision described as an anatomizing process, to lay a body 'widely open' suggests the violence and disruption involved in such acts of discovery. The conquering power of the eye cruelly violates the integrity of a body.³³

Renaissance anatomists displayed human bodies as living beings standing in natural or artificial settings and in which portions of the body were laid open with skin peeled back to reveal the interior organs. Female figures in which the observer could see directly into the dissected womb included images from Charles Estienne, *De dissectione* (1545), Berengarius, *Isagoge Brevis* (1522), and Spigelius, *De formato foeto* (1627). In 1618, Pietro Berrettini drew a naked maiden holding open the dissected skin of her own stomach and womb in an act of revealing her own interior. Gaetano Petrioli engraved and published Berrettini's figure in 1741 and showed an accompanying inset of a womb containing a fetus. These images were part of a transition in which the arcane and mysterious secrets of the female body became public knowledge revealed through science. Woman's womb, which had defined woman herself as a mysterious and uncontrollable uterine force, now became part of a scientific anatomy lesson that sought to master the body through intellect and art. As Sawday puts it: "Once the uterus was seen, however, it had to be mastered in a complex process of representation. . . . Berrettini's figure peels back the surface tissue of her body . . . as though her body is no more than a vehicle for a vagina. . . . If she is casually made to open herself to the gaze of science, then science could not resist moralizing her body even as it stared into her."³⁴

model of the world, as it is and not as any man's own reason tells him it is. But this can be done only by performing a most careful dissection and anatomy of the world."

³³ Quoting Hodges, *Renaissance Fictions*, p. 95, with reference to Timothy Reiss, *Discourse of Modernism* (Ithaca: Cornell University Press, 1982), 189.

³⁴ Sawday, *Body Emblazoned*, quotation on 222–23. For the illustrations see figures 25–31. A series of human figures in erotic poses with dissected wombs was produced by Charles Estienne, *De dissectione partium corporis humani* (Paris, 1545). See Talvacchia, *Taking Positions*, Figures 58, 60, 66, 67, pp.167–78. See also Figure 68, "Anatomical Study," woodcut from Walter Hermann Ryff, *Anatomi* (Strasbourg, 1541), Talvacchia, 185.

The anatomical theater reflected the microcosm-macrocosm framework of the Renaissance—the anatomy of the world. Moving upward and outward from the female earth at the center of the macrocosm in increasing concentric circles were the four elements—earth, water, air, and fire—followed by orbits of the moon and seven known planets, the *primum mobile*, and the empyrean heaven of God.³⁵ Moving upward and outward from the supine corpse flayed open on the dissecting table of the Leiden anatomy theater (ca. 1609) were cascading rings of benches occupied by hierarchies of professors, students, and public witnesses of the anatomy lesson, as well as human and animal skeletons. The learned professor stands at center stage just above body, right hand gesticulating toward an open book of knowledge, while an assistant points to the parts of the body. Above the professor's head a pair of open compasses (within the instrument cabinet), symbolize the geometrical proportions of the body, the theater, and the globe itself and point to skeletons of Adam and Eve (holding spade and apple respectively) flanking the corpse. Adam and Eve as fallen humans who have lost eternal life now contribute to a recovery of knowledge through the dissection of the body.³⁶

The anatomy theater as site for dissection and setting for the public gaze was a prototype for a Baconian experimental science that could be repeated, verified, and exposed to public scrutiny. Francis Bacon's rhetoric about the constraint of nature sets up the ideal of a new experimental science in controlled conditions that can be witnessed, replicated, and verified by any observer. The anatomy amphitheater is an enclosed, circular, public space where attention can be focused on the experiment being conducted at the center of the theater. The experimenter, scalpel in hand, who stands over the table on which lies the corpse or animal to be dissected, is isolated from the natural environment and constrained by the very bounds of the artificial space. The experimental method that Bacon's work inspired de-

³⁵ For an illustration, see Robert Fludd, *Utriusque Cosmi Maioris Scilicet et Minoris Metaphysica*. . . . (Oppenheim, 1617), title page. Bacon criticized the microcosm theory: "The ancient opinion that man was Microcosmus, an abstract or model of the world, hath been fantastically strained by Paracelsus and the alchemists, as if there were to be found in man's body certain correspondences and parallels, which should have respect to all varieties of things, as stars, planets, minerals, which are extant in the great world." Bacon, *Advancement of Learning*, in *Works*, 3: 370.

³⁶ Sawday, *Body Emblazoned*, "View of Leiden Anatomy Theater, c. 1609," Figure 6. For a discussion see 72–76. The professor is Peter Pauw, chair of anatomy (appointed in 1589) and the theater is modeled after that at Padua. William Harvey, physician to both Francis Bacon and James I of England studied anatomy at Padua. We may presume that Bacon was fully cognizant of advances in anatomy and dissection.

depends on a set of isolated, constrained operations in confined, controlled spaces that can be witnessed, recreated, and repeated at any subsequent time and place. The end result creates a true “anatomy of the world.”

The modern scientific laboratory, funded by public money and open to the scrutiny of the scientific community and the discerning public, is an offspring of the anatomy theater of the Renaissance. The experiments of the researchers in Bacon’s *New Atlantis*, the “searchers and spies of nature” who “hound[ed] nature in her wanderings,” and the struggles of Proteus to escape his bonds all formed part of an emerging Baconian experimental method that would be brought to fruition by the scientific societies of the seventeenth century.³⁷ Observations of the natural world could be assembled, organized, and compared in a central location—a laboratory or research center modeled after Salomon’s House in the *New Atlantis*. Zoos and botanical gardens, as central spaces, reassembled and displayed under controlled conditions the species of animals and plants brought by explorers from around the globe. The secrets of the heavens could be observed through telescopes and the secrets of the soil and water through microscopes. The data were meaningless, however, without centralization, comparison, analysis, and publication.³⁸

Francis Bacon’s achievement was to draw together and ferret out the disparate strands of the occult sciences that delved into the “secrets of nature,” transforming them into a new program of experimentation on nature. Magic, superstition, witchcraft, divination, and sorcery were all sources for determining what was useful. Nature under the constraints of art (technology) would reveal possibilities yet to be imagined. That Nature gendered as female held secrets that could be extracted from her womb or bosom through art and observation and that women held secrets that could be extracted through dissection of her womb or bosom were part and parcel of the same tradition and transformation. That those methods of constraint and extraction could be seen as violent was equally a part of the transformation of natural philosophy and the emergence of the experimental method.³⁹

Rhetorical meanings and the practical arts melded together across a spectrum of possibilities; the hand (technology) and the eye (observation)

³⁷ Bacon, *De Dignitate*, in *Works*, 4: 287, 294, 296, 298.

³⁸ Bruno Latour, “Visualization and Cognition,” in *Knowledge and Society: Studies in the Sociology of Culture Past and Present* (Greenwich, Conn.: JAI Press, 1986), 22, 29.

³⁹ Carolyn Merchant, “The Scientific Revolution and the Death of Nature,” *Isis*, 97 (2006): 513–33.

functioned together to craft a new empirical methodology. The material and the visual combined to produce power over nature. “By art and the hand of man,” Bacon stated, nature can be “forced out of her natural state and squeezed and molded” into revealing her hidden secrets.⁴⁰ Under the mechanical arts, he wrote, “nature betrays her secrets more fully . . . than when in enjoyment of her natural liberty.” Technological discoveries “help us to think about the secrets still locked in nature’s bosom.” “They do not, like the old, merely exert a gentle guidance over nature’s course; they have the power to conquer and subdue her, to shake her to her foundations.”⁴¹ Bacon’s new method was part of an emerging framework of science, technology, capitalist development, and Christian religion that provided hope for the recovery of humanity’s dominion over nature lost in the Fall from Eden.

Were the results of the new experimental method useful? Did they improve the state of humanity? Unquestionably, the answer is yes. Were there costs for peoples throughout the world, for the environment, and for the laboring classes? That answer, too, must be yes. Francis Bacon alone cannot be held responsible for such outcomes. Yet Bacon was a pivotal figure in a larger movement. He lived during a period of enormous expansion of knowledge, of social and intellectual upheaval, and of the widening and consolidation of political power. That he grasped and reflected those trends eloquently in his writings is to the benefit or, as some might suggest, the detriment of humankind. In either case, however, Bacon stood for the revealing of the “secrets of nature” for all to contemplate, admire, denounce, share, and put to use.

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⁴⁰ Merchant, *Death of Nature*, 171, 172. Bacon, *Novum Organum*, in *Works*, 4: 246; *The Great Instauration*, in *Works* 4: 29; *Novum Organum*, in *Works*, 4: 247.

⁴¹ Bacon, “Thoughts and Conclusions on the Interpretation of Nature or A Science of Productive Works,” trans. Benjamin Farrington, in Farrington, *The Philosophy of Francis Bacon* (Liverpool: Liverpool University Press, 1964), 99, 96, 93.

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